

FLAT ELECTRICAL CABLE CONNECTION WITH
PRINTED CIRCUIT BOARD

BACKGROUND OF THE INVENTION

Field of the Invention

This invention relates to a flat electrical cable connection with a printed circuit board which is suitable for connecting circuit board connector pins to a connecting end of a flat electrical cable which is to extend through a slit formed in a partition wall.

Description of the Prior Art

10 A flat electrical cable is used, for example, to connect a rotary transformer located within a cylindrical housing of a rotary head mechanism of a video tape recorder with connector pins located outside the housing. In this case, conventionally a slit is
15 formed in a partition wall of the housing so as to allow the flat cable to extend therethrough.

However, in such a flat cable connection as described above, if the slit formed in a circumferential wall of the housing is large, dust may readily enter
20 the housing. Further, a slit reduces the strength of the housing. Therefore, it is desirable to minimize

the size of the slit. However, the connector pins must be disposed in a spaced relationship with one another by a predetermined fixed distance on a printed circuit board to be connected with a connecting end of the cable. In this instance, it is a disadvantage that, because it is necessary to assure a distance for insulation between adjacent pins and since the diameter of the pins cannot be reduced below a particular limit, if the number of the pins is increased, the width of a connecting end of the flat cable must be increased accordingly and as a result the size of the slit formed in the cylinder must be increased so as to allow the connecting end of the flat cable to pass therethrough for subsequent connection to the printed circuit board. It is also a problem that the operation of passing the flat cable through the slit is not readily performed.

SUMMARY OF THE INVENTION

It is an object of the present invention to provide a flat electrical cable connection with a printed circuit board wherein an end of a flat cable at which the flat cable is to be connected to connector pins need not be widened.

It is another object of the invention to provide

a flat electrical cable connection with a printed circuit board which is conveniently used where a flat cable must be passed through a slit formed in a partition wall in order to establish connection thereof with connector pins.

It is a further object of the invention to provide a flat electrical cable connection with a printed circuit board which allows a slit which is formed in a partition wall and through which the cable is to extend for connection with an electrical component to be minimized in size and which improves the ease of passing the cable through the slit for subsequent connection to connector pins.

In order to attain the objects, according to the present invention, there is provided a flat electrical cable connection with a printed circuit board wherein the cable has a plurality of printed wires and the printed circuit board has a plurality of connector pins and the cable defines a hole at a connecting end thereof, said hole receiving one of said pins, the hole and pin establishing a mechanical and an electrical connection between said cable and said printed circuit board, said hole extending through a section of one of said printed wires on said flat cable, the remaining wires having respective printed wire connecting sections disposed at an edge or edges of the cable at the connecting end of said flat cable, and a

plurality of conductor sections formed by printing on said printed circuit board and connecting said printed wire connecting sections of said remaining wires to respective ones of the remaining connector pins.

With a connection of the invention, the connection can be established without increasing the width of the connecting end of the flat cable independently of the number and arrangement of the connector pins. Accordingly, where the flat cable must be passed through a slit formed in a partition wall when it is installed for subsequent connection to the printed circuit board, the size of the slit can be minimized, and the operation of passing the flat cable through the slit can be performed easily and efficiently because the flat cable can simply be pushed through the slit.

A specific embodiment of the present invention will hereinafter be described in detail, by way of example, with reference to a Figure of the accompanying drawings, the other Figures of which illustrate prior art constructions which will also be described in detail.

BRIEF DESCRIPTION OF THE DRAWINGS

FIG. 1 is a schematic view of a flat cable

connecting device in accordance with the present invention;

FIG. 2 is a view similar to Figure 1 but illustrating a typical conventional flat cable connecting device;

FIG. 3 is a view similar to Figure 1 but illustrating another typical conventional flat cable connecting device; and

FIG. 4 is a side elevational view, to a reduced size, showing a rotary head of a video tape recorder having a flat cable connecting device as shown in Figure 3.

DETAILED DESCRIPTION WITH REFERENCE TO THE
ACCOMPANYING DRAWINGS

Figures 2, 3 and 4 show conventional flat cable connections with printed circuit boards having disadvantages such as already alluded to above.

Referring to Figure 2, a flat cable 25 has a plurality of printed wires 26 formed thereon and a plurality of small holes 28 formed through the printed wires 26 at a connecting end thereof for receiving therein connector pins 24 securely mounted on a printed circuit board 23 to establish mechanical and electrical connection between the connecting end of the flat cable 25 and the printed circuit board 23. The small holes

28 are arranged in a row extending in a direction transverse to the longitudinal axis of the flat cable 25. Accordingly, the connecting end of the flat cable 25 at which the small holes 28 are formed for connection with the printed circuit board 23 is widened relative to the main run of the flat cable 25, as seen in Figure 2. The flat cable 25 extends through a slit 31 formed in a partition wall 21 such as a circumferential wall of a cylindrical housing of a rotary head mechanism of a video tape recorder. Thus, in connecting the flat cable 25 to the printed circuit board 23, the widened connecting end of the flat cable 25 must be passed through the slit 31, for example, in a manner as shown in phantom in Figure 2.

15 In the arrangement of Figure 3, small holes 28 at a connecting end of a flat cable 25 for receiving therein connector pins 24 on a printed circuit board 23 are arranged in a row extending in the direction of the longitudinal axis of the cable 25. The flat cable 25 is also widened at its connecting end as seen in Figure 3. Accordingly, a slit 31 formed in a partition wall 21 has a sufficient width to allow the widened connecting end of the flat cable 25 to pass therethrough.

25 Where the arrangement of Figure 3 is employed,

the connecting end of the cable must be arranged axially of a rotary head 32 as seen in Figure 4. Consequently, the connecting end of the cable and the printed circuit board lie in a position in which they cover part of
5 the outer periphery of the head 32. Accordingly, there is the possibility that a magnetic tape may make contact with the connector or the printed circuit board, and hence the arrangement is not to be preferred.

Referring now to Figure 1, there is shown a
10 flat cable connection with a printed circuit board according to the present invention, applied to a rotary head in a video tape recorder. The rotary head of the video tape recorder includes a stationary cylindrical housing 1, and a rotary transformer (not shown) is
15 located within the housing, while the cable connection 2 with the printed circuit board 3 is located outside the housing. A plurality of (for example, 6) connector pins 4a, 4b, 4c are disposed in a lateral row on the printed circuit board 3.

20 A flat cable 5 is provided for connecting the rotary transformer with the connector pins 4. The cable 5 has a plurality of (for example, 6) printed wires 6a, 6b, 6c formed thereon. A rectangular aperture 7 is formed at the connecting end of the flat cable
25 5 at which the flat cable 5 is connected to the connector

pins 4a, 4b, 4c, and also a pair of small holes 8 for receiving the connector pins 4b therein. The holes 8 are formed in portions of the connecting end of the flat cable 5 disposed respectively on opposite sides of the aperture 7.

The flat cable 5 further has a pair of printed wire connecting conducting areas or sections 9 formed at portions of the transverse edge of the aperture 7 remote from the cable end as extensions of the two centrally located printed wires 6a.

The two printed wires 6b adjacent the two printed wires 6a extend respectively to conducting sections perforated by the small holes 8, these sections thus surrounding the small holes 8.

A pair of printed wire connecting conducting areas or sections 10 are formed at opposite side edges of the flat cable 5 adjacent the connecting end of the cable as extensions of the two outermost printed wires 6c.

It can be seen from Figure 1 that the connecting end of the flat cable 5 is not widened, that is, it has the same width as the main run of the flat cable, the cable being of uniform width, and the flat cable 5 extends through a slit 11 formed in a partition wall, that is, a circumferential wall of the housing 1 with

minimal clearance.

Meanwhile, the printed circuit board 3 has formed, by printing thereon, a pair of conductor sections 12 for electrically connecting the two centrally located
5 connector pins 4a with the pair of printed wire connecting sections 9 at the edge of the aperture 7 remote from the cable end, and another pair of conductor sections 13 for electrically connecting the outermost connector pins 4c with the pair of printed wire
10 connecting sections 10 at the opposite side edges of the flat cable 5.

With the arrangement described with reference to Figure 1, in connecting the flat cable 5 to the connector pins 4a, 4b, 4c, at first the connecting
15 end of the flat cable 5 is passed through the slit 11 and is led out of the stationary housing 1. Then, the second outermost pair of connector pins 4b are passed through the small holes 8 to temporarily secure the connecting end of the flat cable 5 to the circuit
20 board.

After that, the connector pins 4b and the printed wires 6b are connected mechanically and electrically to each other by a suitable known means such as soldering, and then the printed wire connecting sections
25 9 and the conductor sections 12 as well as the printed

wire connecting sections 10 and the conductor sections 13 are connected to each other in a similar manner.

In this way, with the construction described with reference to Figure 1, the connecting end of the flat cable 5 is temporarily secured to the printed circuit board 3 by inserting the connecting pins 4b into the small holes 8, and in this state, connection between all the connector pins 4 and all the printed wires 6 can readily be performed.

Thus, since only two printed wires (6b) are directly connected to the connector pins 4 while the other printed wires 6a, 6c are connected indirectly to the connector pins 4a, 4b, 4c, respectively, by connection between the printed wire connecting sections 9, 10 and the conductor sections 12, 13 respectively, connection can be established without increasing the width of the connecting end of the flat cable 5 with respect to the main run of same. Furthermore, this may be achieved independently of the number and arrangement of connector pins 4.

Accordingly, the length of the slit 11 need only be a little greater than the width of the flat cable 5 and hence can be minimized. Further, the operation of passing the flat cable 5 through the slit 11 can readily be performed.

The flat cable 5 may have a single small hole 8 for inserting a connecting pin 4b therethrough. Further, the aperture 7 need not necessarily be rectangular and the sections 9, 10 may be formed at any longitudinal or transverse edge of the connecting end of the cable.

As apparent from the foregoing description, the width of the connecting end of a flat cable such as 5 need not necessarily be increased, and accordingly the size of a slit for passing the flat cable there-
through can be minimized. Further, an operation for passing the flat cable through the slit can be performed readily and efficiently.



CLAIMS:

1. A flat electrical cable connection with a printed circuit board wherein the cable has a plurality of printed wires and the printed circuit board has a plurality of connector pins and the cable defines a hole at a connecting end thereof, said hole receiving one of said pins, the hole and pin establishing a mechanical and an electrical connection between said cable and said printed circuit board, said hole extending through a section of one of said printed wires on said flat cable, the remaining wires having respective printed wire connecting sections disposed at an edge or edges of the cable at the connecting end of said flat cable, and a plurality of conductor sections formed by printing on said printed circuit board and connecting said printed wire connecting sections of said remaining wires to respective ones of the remaining connector pins.

2. A connection according to claim 1, wherein the cable is of uniform width.

3. A connection according to claim 1 or 2, wherein some at least of said printed wire connecting sections of said remaining wires are located respectively at opposite side edges of the connecting end of the cable.

4. A connection according to claim 1, 2 or 3 wherein one at least of said printed wire connecting



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sections of said remaining wires is located at a transverse edge of the cable.

5. A connection according to claim 4, wherein said transverse edge in part defines an aperture in the cable.

6. A flat electrical cable connection with a printed circuit board substantially as hereinbefore described with reference to, and as shown in, Figure 1 of the accompanying drawings.
